

CLAIMS

What is claimed is:

1. A liquid crystal display device comprising:
a pair of substrates including a first substrate having pixel electrodes, active devices and an alignment film, and a second substrate having an opposing electrode and an alignment film; and
a liquid crystal layer containing nematic liquid crystal molecules and a cured-product formed three-dimensionally of a composition having a liquid crystal skeletal structure, and sandwiched between the pair of substrates;
wherein deformation of the liquid crystal layer is at least spray deformation or bend deformation.
2. A liquid crystal display device according to claim 1, wherein a concentration of the composition is from 0.3 to 3 wt%.
3. A liquid crystal display device according to claim 2, wherein at least one of the substrates of the pair of substrates has slits of electrodes or protrusions, and at least one of the substrates of the pair of substrates has the alignment film for aligning a major axis direction of the liquid crystal molecules substantially vertically to a surface of the substrate.
4. A method of producing the liquid crystal display device according to claim 3 comprising the step of determining the concentration of the composition so as to satisfy the following relation when a mean value of an angle described

between the liquid crystal skeletal structure and the first substrate in a polar angle direction is α , pre-tilt angles of the liquid crystal molecules on interfaces of the first and second substrates are β_1 and β_2 , respectively, and a mean value of an angle between the liquid crystal molecules and the first substrate is θ :

at the time of non-application of a voltage;

when dielectric anisotropy of the liquid crystal molecules is negative,

$$\alpha < \theta < (\beta_1 + \beta_2)/2;$$

when dielectric anisotropy of the liquid crystal molecules is positive,

$$(\beta_1 + \beta_2)/2 < \theta < \alpha; \text{ and}$$

at the time of application of a voltage,

when dielectric anisotropy of the liquid crystal molecules is negative,

$$(\beta_1 + \beta_2)/2 - \theta < \theta - \alpha; \text{ and}$$

when dielectric anisotropy of the liquid crystal molecules is positive,

$$\theta - (\beta_1 + \beta_2)/2 < \alpha - \theta.$$

5. A liquid crystal display device comprising:

a pair of substrates including a first substrate having pixel electrodes, active devices and an alignment film, and a second substrate having an opposing electrode and an alignment film; and

a liquid crystal layer containing nematic liquid crystal molecules and a cured-product formed three-dimensionally of a composition having a liquid crystal skeletal structure, and sandwiched between the pair of substrates;

wherein deformation of the liquid crystal layer is at least spray deformation or bend deformation, and a

concentration of the composition is from 0.3 to 3 wt% and satisfies the following relation when a mean value of an angle described between the liquid crystal skeletal structure and the first substrate in a polar angle direction is α , pre-tilt angles of the liquid crystal molecules on interfaces of the first and second substrates are β_1 and β_2 , respectively, and a mean value of an angle between the liquid crystal molecules and the first substrate is θ :

at the time of non-application of a voltage;

when dielectric anisotropy of the liquid crystal molecules is negative,

$$\alpha < \theta < (\beta_1 + \beta_2)/2;$$

when dielectric anisotropy of the liquid crystal molecules is positive,

$$(\beta_1 + \beta_2)/2 < \theta < \alpha; \text{ and}$$

at the time of application of a voltage,

when dielectric anisotropy of the liquid crystal molecules is negative,

$$(\beta_1 + \beta_2)/2 - \theta < \theta - \alpha; \text{ and}$$

when dielectric anisotropy of the liquid crystal molecules is positive,

$$\theta - (\beta_1 + \beta_2)/2 < \alpha - \theta.$$

6. A liquid crystal display device according to claim 5, wherein at least one of the substrates of the pair of substrates has slits of electrodes or protrusions, and at least one of the substrates of the pair of substrates has the alignment film for aligning a major axis direction of the liquid crystal molecules substantially vertically to a surface of the substrate.